

Integrating Demand Resources into ISO Operations

Presented by:

Henry Yoshimura, Director, Demand Resource Strategy

John Norden, Manager, Renewable Resource Integration

May 29, 2008

Table of Contents

- Background
 - Demand Resource Definitions
 - Forward Capacity Auction Results
- A Look At the Future: Operable Capacity Analysis
- Proposed Market Rule Clarifications and Enhancements
- Risk Management Strategies
- Next Steps
- Technical Appendix

Demand Resources

- Installed Measures that result in verifiable reductions in end-use consumption of electricity.
- **Passive Demand Resources (Passive DR)**
 - Save energy (MWh) during peak hours.
 - Are *not* dispatchable.
 - Include On-Peak and Seasonal Peak FCM Resources.
- **Active Demand Resources (Active DR)**
 - Are designed to reduce peak loads (MW).
 - Can reduce load based on real-time system conditions or ISO instructions.
 - Include Critical Peak, Real-Time Demand Response (RTDR), Real-Time Emergency Generation (RTEG) in the FCM.

Demand Resource Types in the FCM

- On-Peak – Passive
- Seasonal Peak – Passive
- Critical Peak – Active
- Real-Time Demand Response (RTDR) - Active
- Real-Time Emergency Generation (RTEG) - Active

Demand Resources in the FCM

- 2,279 MW of Demand Resources cleared in FCA#1
 - All help meet the Installed Capacity Requirement (ICR).
 - 700 MW or 31% represent Passive DR.
 - 1,579 MW or 69% represent Active DR.
 - Active DR value reflects the 600 MW limit on RTEG.
- The total of Demand Resources in FCA #1 and those showing interest in FCA#2 is over 4,200 MW
 - This would represent approximately 12% of ICR in the 2011/12 commitment period.
 - Active DR would represent approximately 9% of the ICR in the 2011/12 commitment period.

Detail of Demand Resources that Cleared in FCA #1 (MW)

Capacity (MW)							
Resource Type	ME	NH	VT	MA	CT	RI	Total
Critical Peak Demand Resource	24	1	0	66	16	0	105
On-Peak Demand Resource	26	44	58	297	84	46	554
Real-Time Demand Response Resource	187	30	24	314	272	47	873
Real-Time Emergency Generation Resource	37	44	20	359	342	73	875
Seasonal Peak Demand Resource	0	0	0	12	134	0	146
Total	273	118	102	1,047	848	165	2,554

Notes:

- All MW values are grossed up by the reserve margin and loss factor.
- Use of Real-Time Emergency Generation Resources to meet ICR is limited to 600 MW.
- The 600 MW cap has not been applied on the values in this table.
- **2,279 MW counting towards ICR = 2,554 MW less 275 MW of excess RTEG that cleared in FCA#1.**

Operable Capacity Analysis

- ***Study Objectives:***

- Estimate the number of hours, days, and MWs that Active DR would be needed to meet the 50/50 and 90/10 hourly peak load conditions plus operating reserve requirements.

- ***Approach and Underlying Assumptions:***

- The System needs enough Operable Capacity to meet actual load plus required operating reserves.
 - Operating procedures are designed to address the few hours per year when there are not enough resources (generation, imports and demand resources) to meet full operating reserve requirements.
- The analysis used the 50/50 load forecast, as well the 90/10 forecast for the peak month of August – *load forecast reduced by Passive DR.*
- The analysis compares generation and imports available in each hour versus the forecasted load plus needed operating reserves, and estimates the number of hours, days, and amount of MWs that load and operating reserve requirements exceed available supply resources (i.e., generation and imports).

Operable Capacity Analysis (Approach)

- ***Study Outputs:***

- If adequate generation and import resources are available to meet forecasted load plus operating reserve requirements, then the analysis shows that Active DR is *not* projected to be needed to maintain reliability.
- If sufficient generation and import resources are not available to meet forecasted load plus operating reserve requirements, the analysis estimates the number of hours, days, and MWs of Active DR needed to maintain reliability.

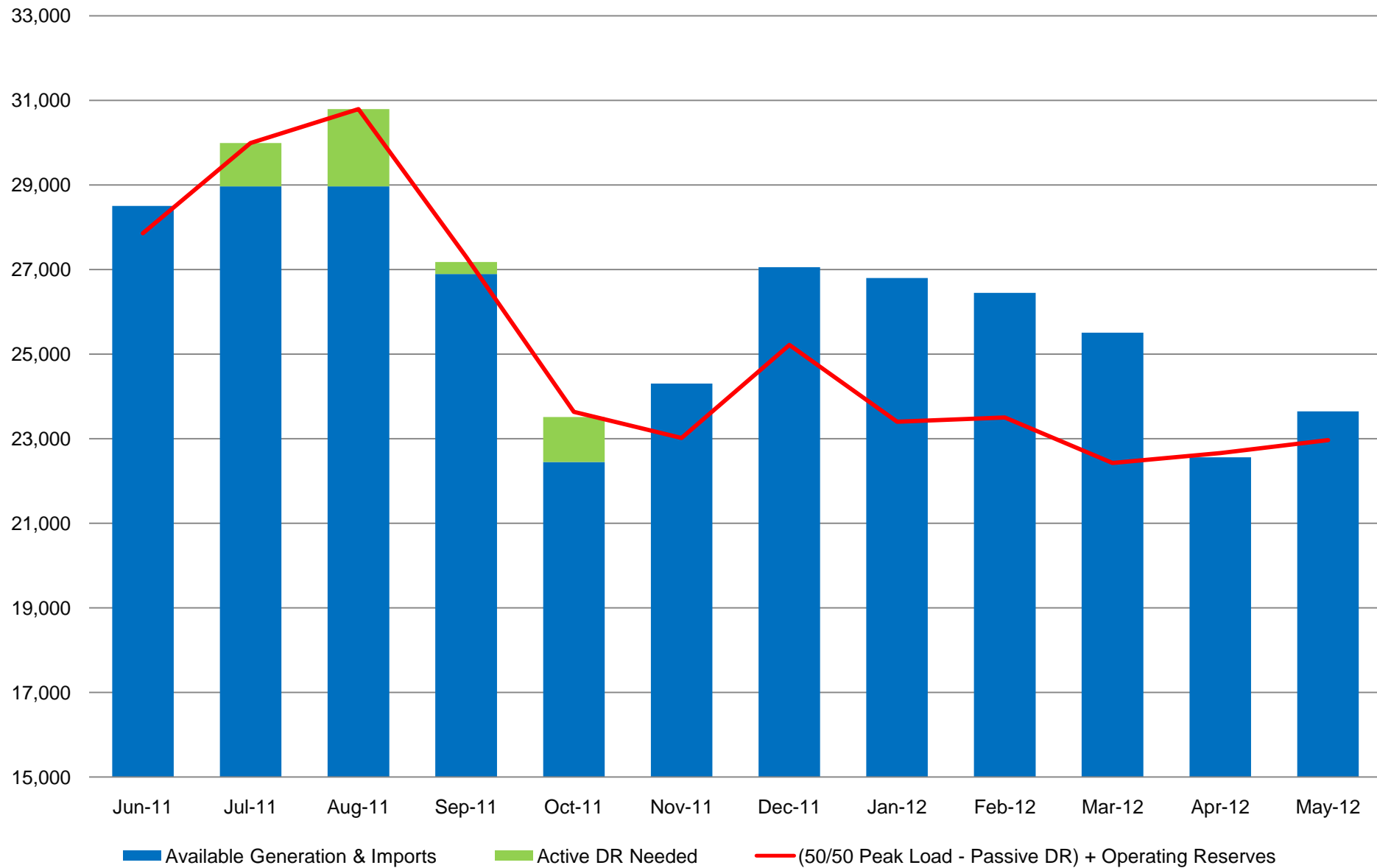
Operable Capacity Analysis (Scenarios)

- Investigated three DR penetration scenarios.
 - Low – What cleared in FCA1, clears in FCA2.
 - Intermediate – Each DR Type entering FCA2 – the sum of what cleared in FCA1 plus SOIs from FCA2 – clears in the same proportion as that which entered the FCA1 auction. Overall, 74% of the DR that entered FCA1 cleared.
 - High – All DR that cleared in FCA1 and all DR SOIs from FCA2 clear in FCA2.

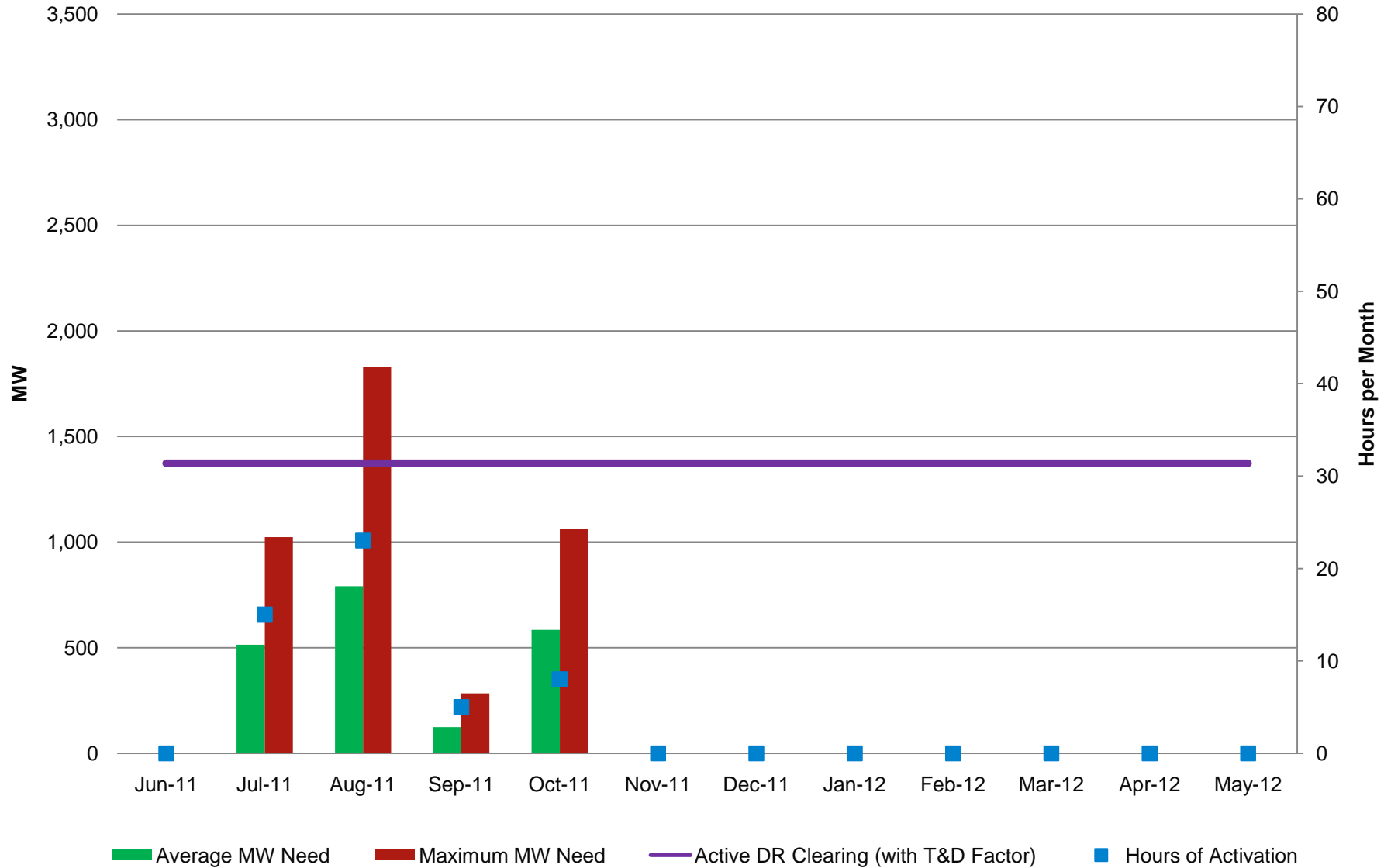
Case	Active DR (MW)	Passive DR (MW)	Total DR (MW)
Low	1,594	711	2,305
Intermediate	2,090	1,142	3,232
High	2,967	1,251	4,218

Note: Capacity values (MW) include 8% T&D and 16.1% Reserve Margin factors.

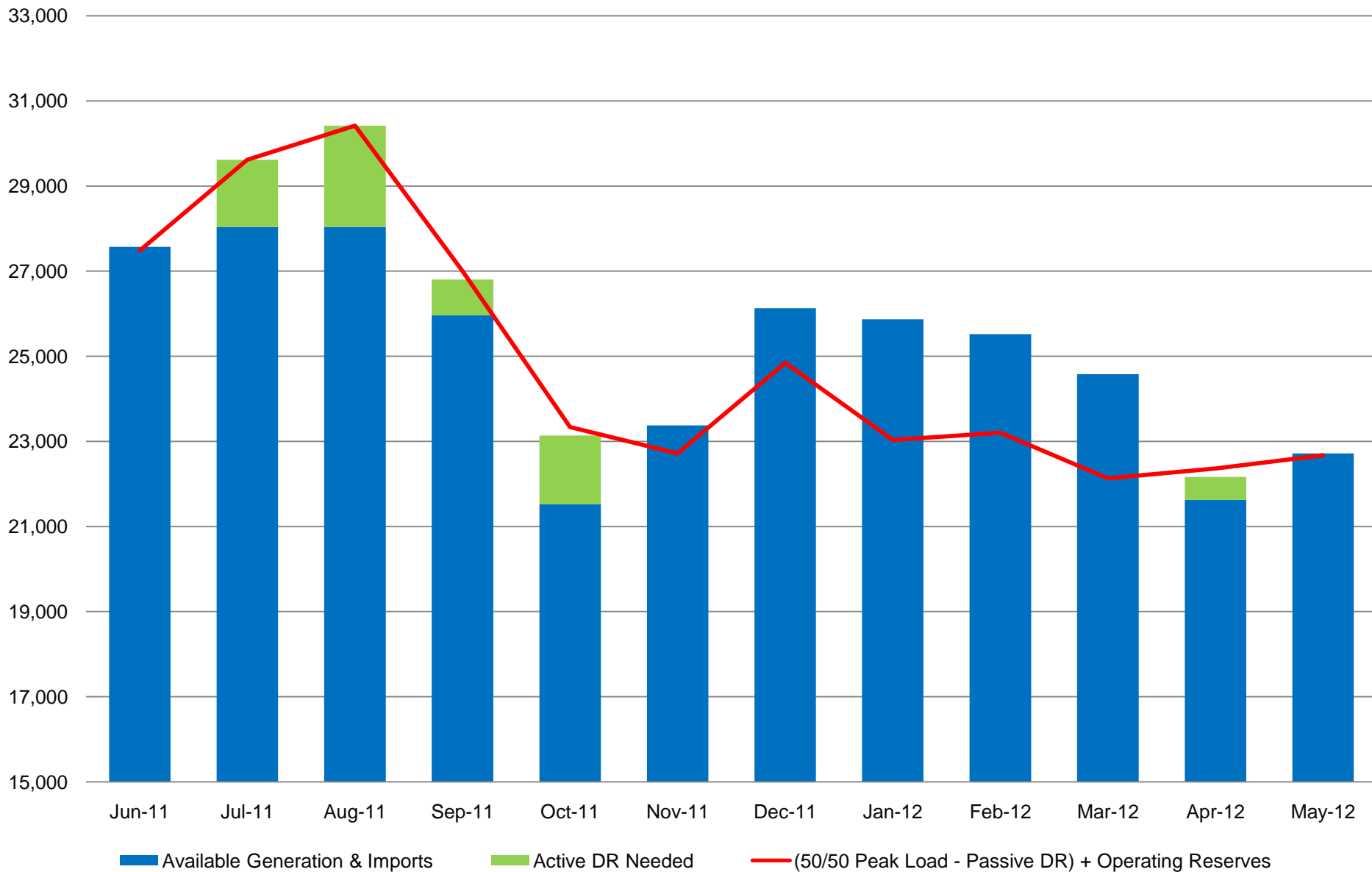
Operable Capacity Analysis - Low Case



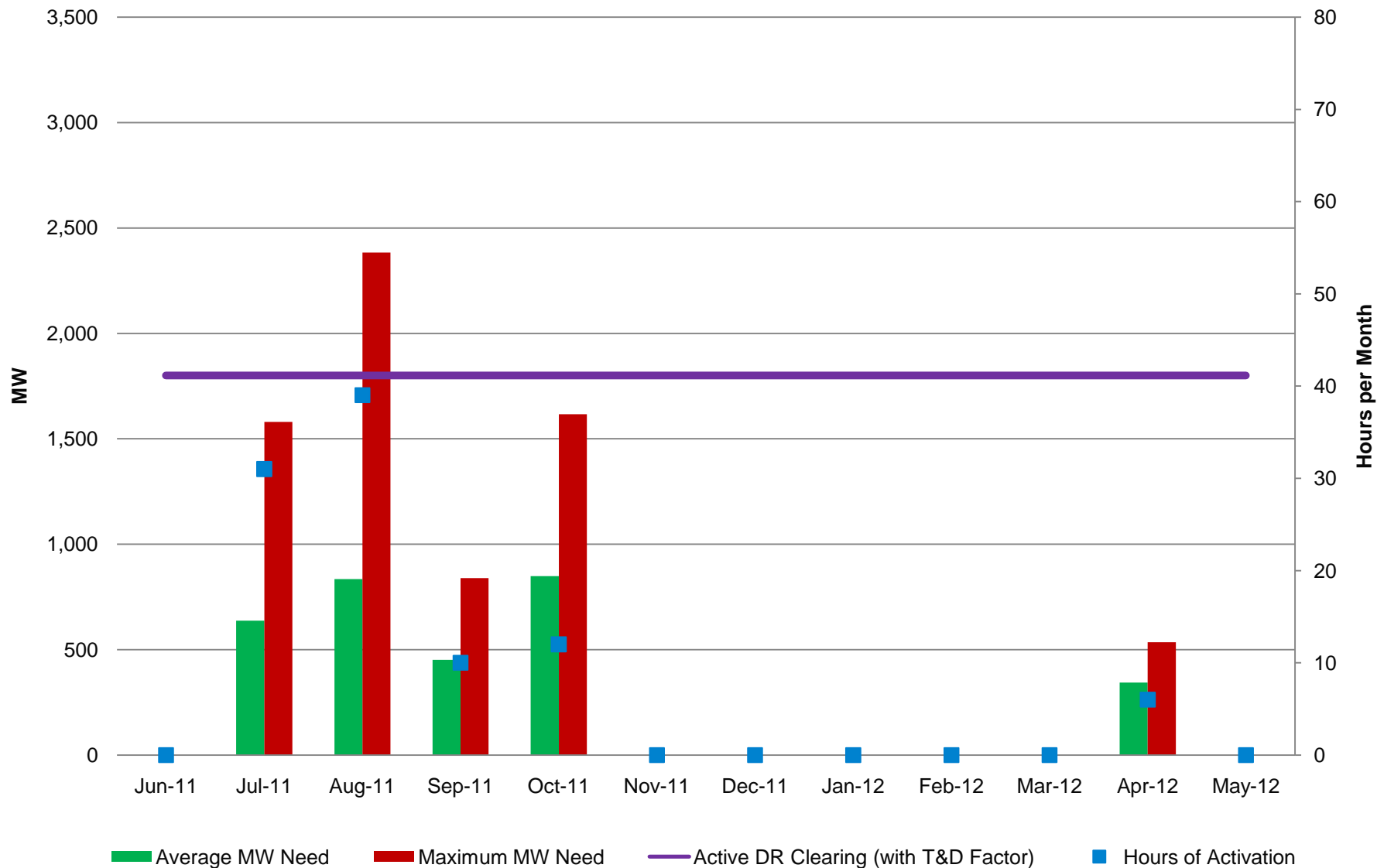
Active DR Need and Hours of DR Activation by Month (Low Case)



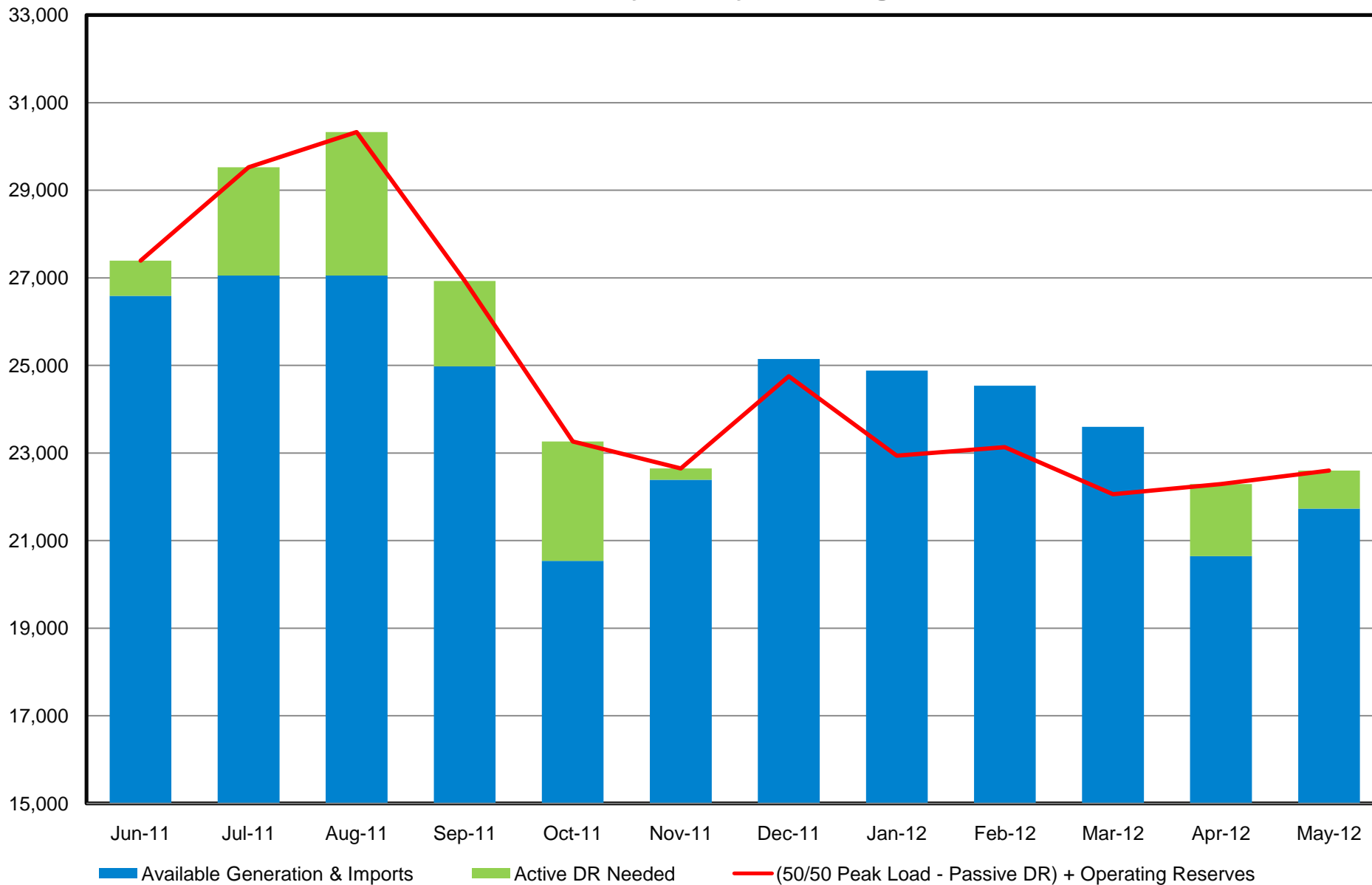
Operable Capacity Analysis - Intermediate Case



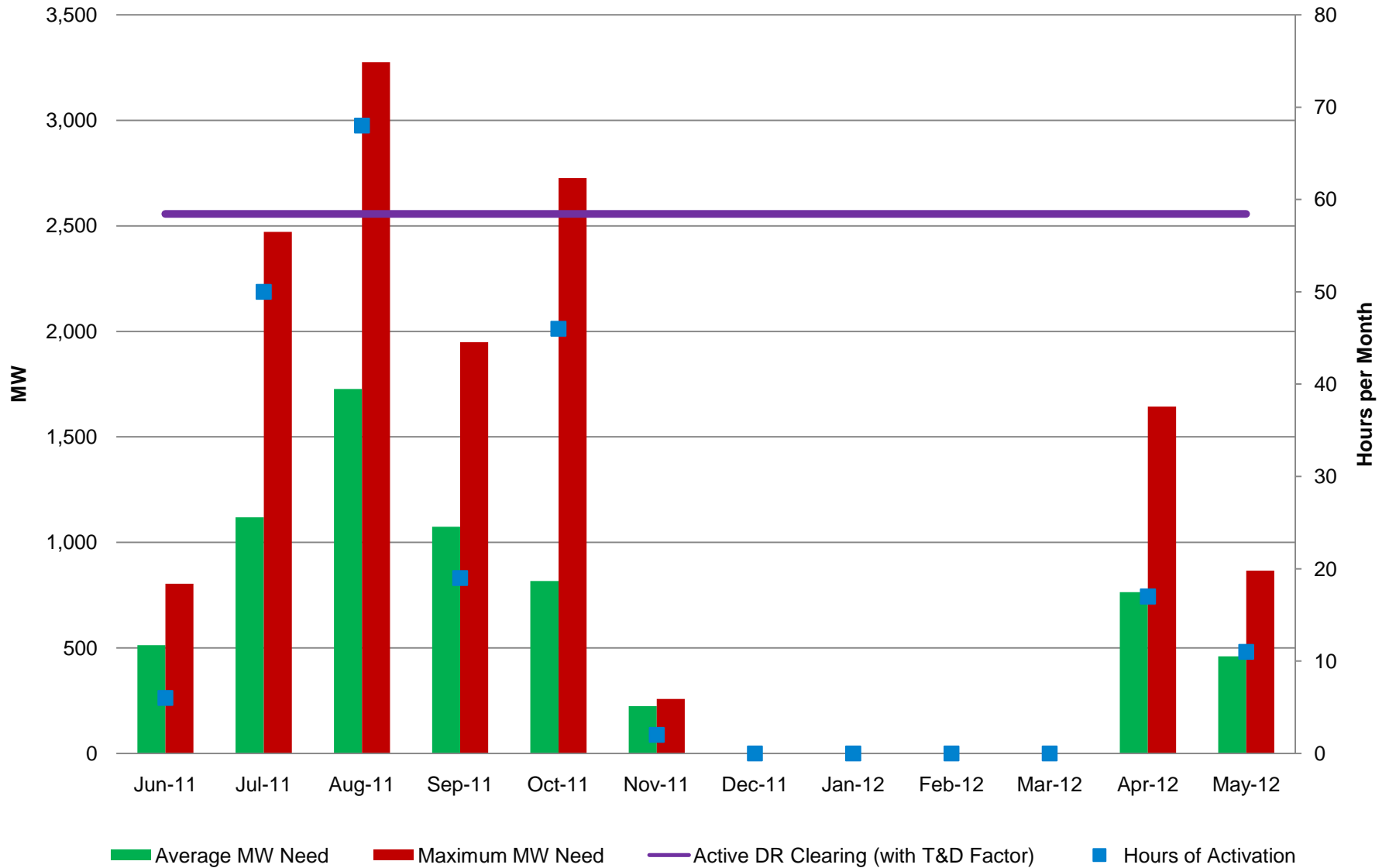
Active DR Need and Hours of DR Activation by Month (Intermediate Case)



Operable Capacity Analysis - High Case



Active DR Need and Hours of DR Activation by Month (High Case)

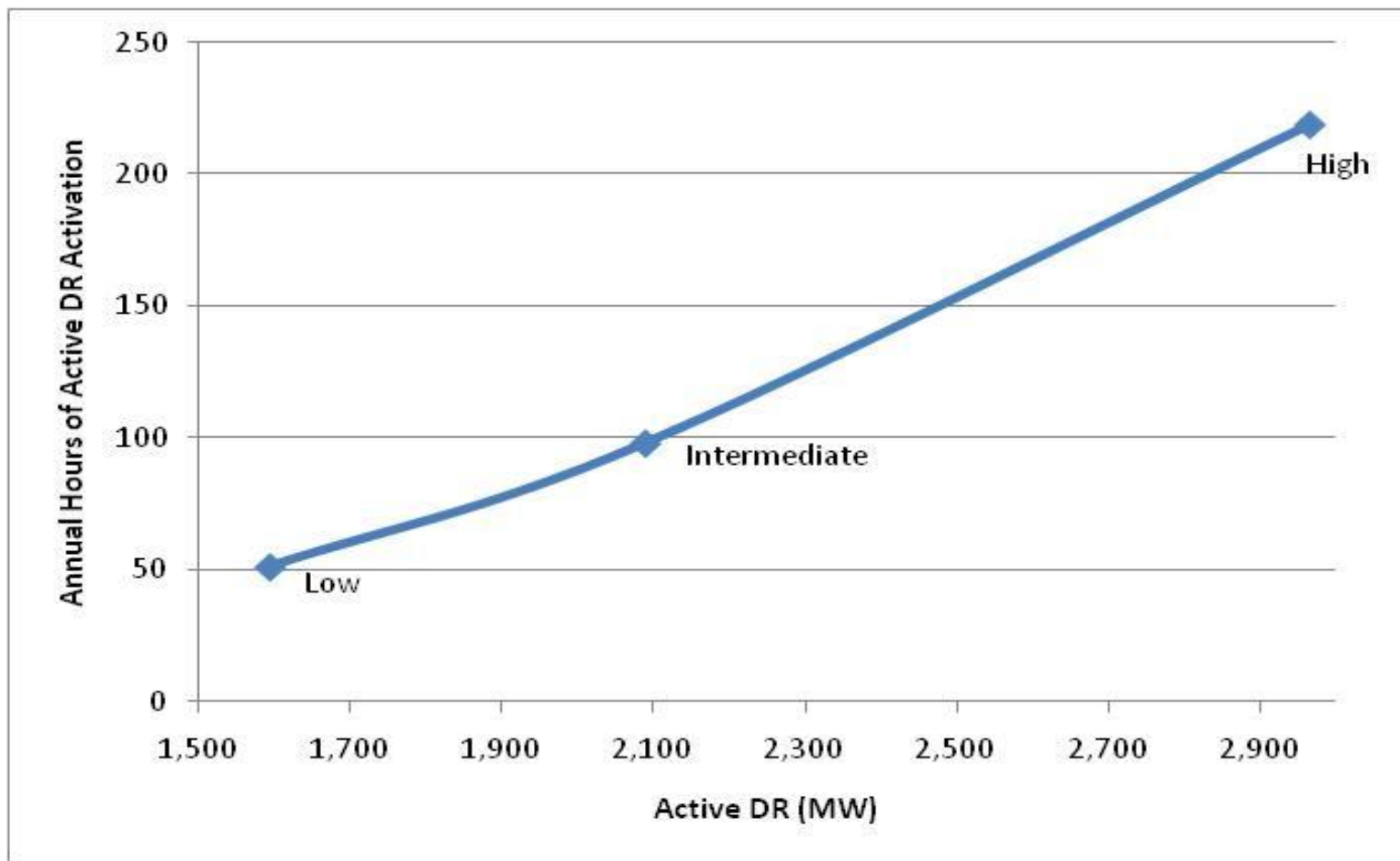


Operable Capacity Analysis: Four Key Observations

1. As The MWs Of Active DR Grow, Their Dispatch Frequency Increases.
2. Active DR Will Be Needed During Off Peak Months.
3. There Are Few Hours When 100% Of The Active DR Is Needed.
4. Under The 90/10 Load Forecast, More Active DR Will Be Called Upon For More Hours.

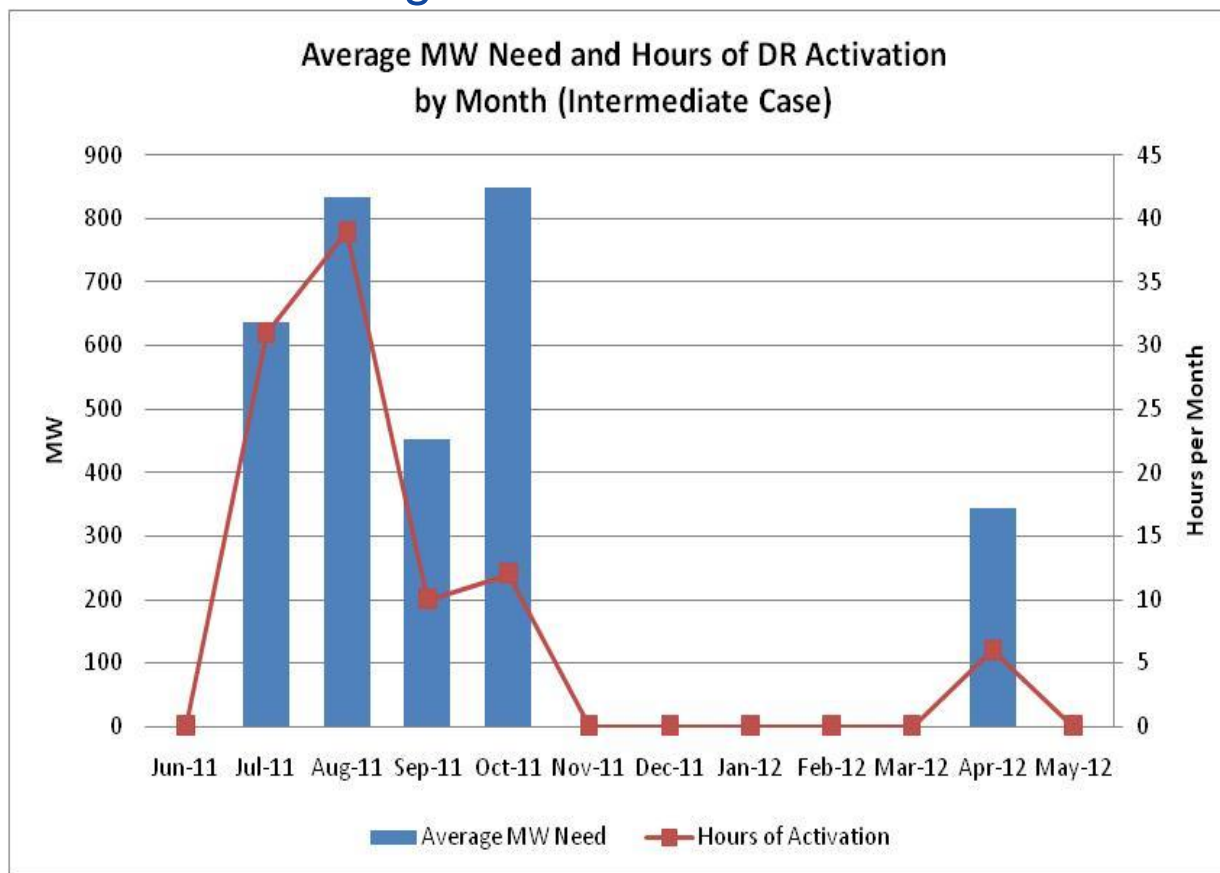
Operable Capacity Analysis – Observation #1

- As the quantity of Active DR increases, the dispatch frequency increases.



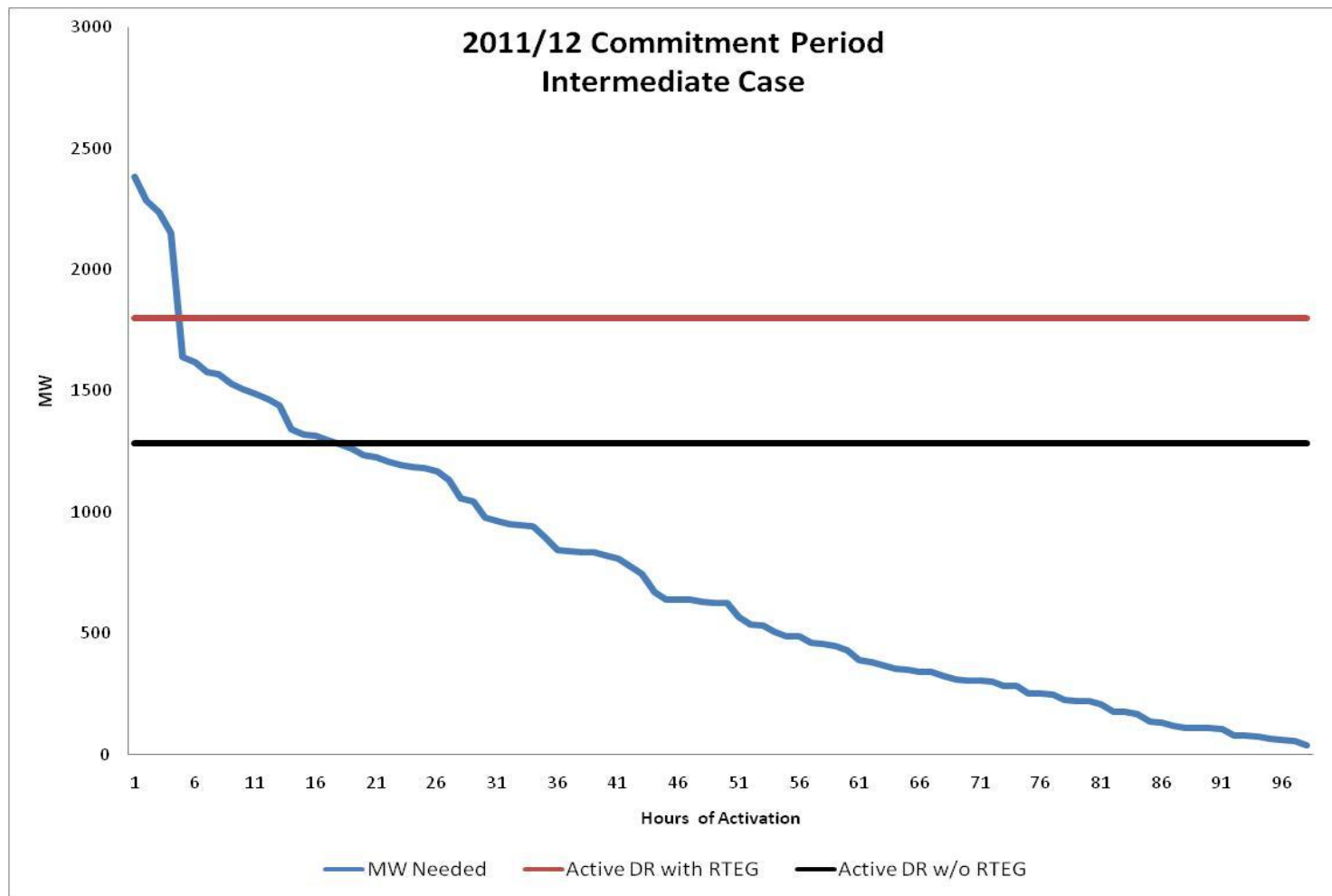
Operable Capacity Analysis – Observation #2

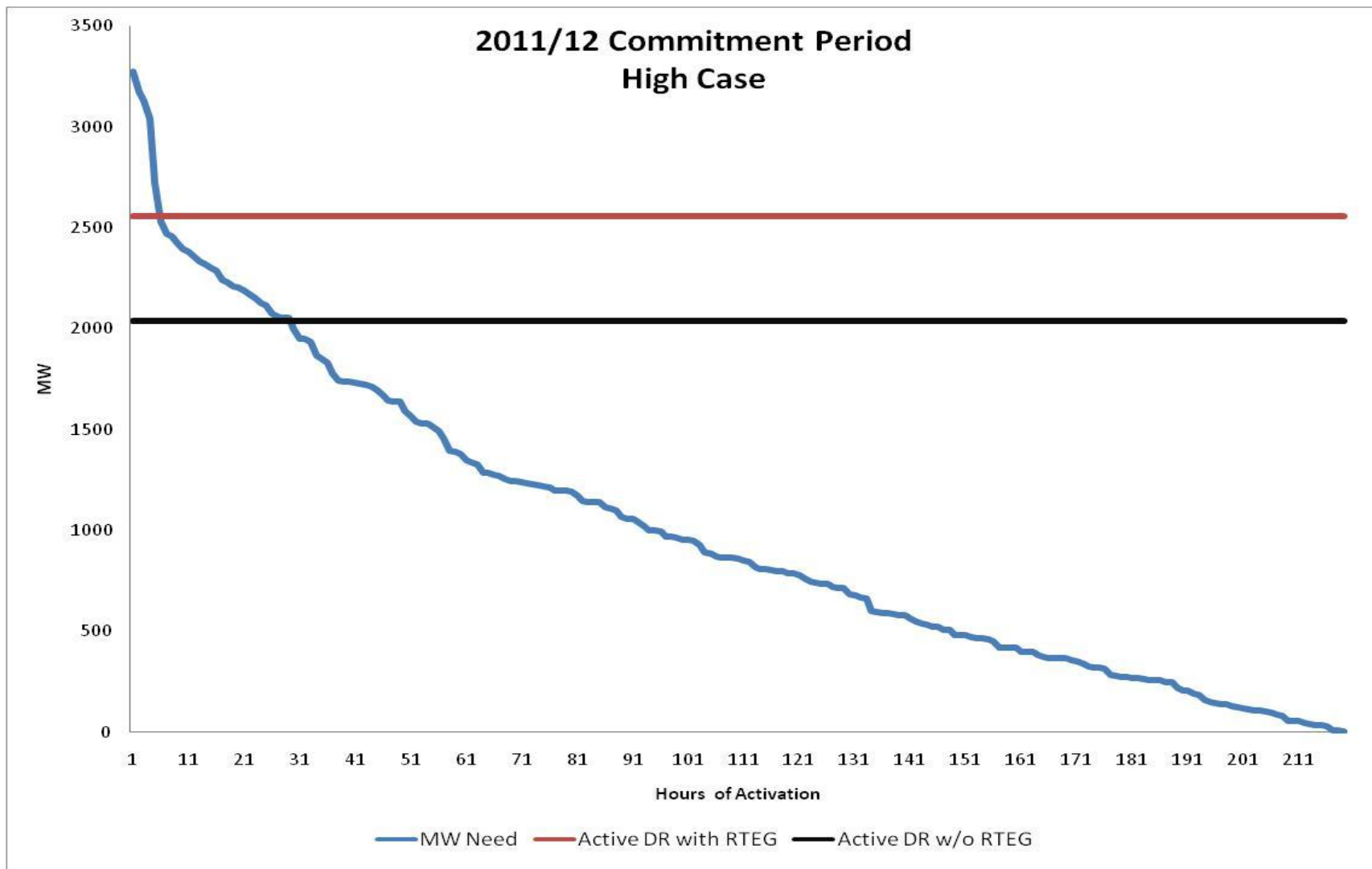
- Active DR Will Be needed during Off Peak months.
 - Increasing amounts of DR displace generation.
 - DR needed when generators are unavailable.



Operable Capacity Analysis – Observation #3

- There Are Few Hours When 100% Of Active DR Is Needed.





Operable Capacity Analysis – Observation #4

- In Extreme Load Conditions, More Active DR Will Be Called Upon For More Hours.

Comparison of 50/50 and 90/10 Forecasts August 2011 (Intermediate Case)		
	50/50 Forecast	90/10 Forecast
# of Hours Load & Operating Reserve exceeds Available Generation	39	86
Corresponding # of Days in August	8	9
Maximum # of Consecutive Days in August	5	5
Average MW that Load and Operating Reserve exceeds Available Generation	835	2,843
Maximum MW that Load and Operating Reserve exceeds Available Generation	2,384	4,504

Challenges for the Future

- More Demand Resources sooner than expected:
 - When writing market rules, ISO expected it would take a few years to reach the Active DR levels achieved under FCA #1.
 - Since completion of the initial rules, enrollment in the real-time demand response program has increased by 400%.
- Active DR is now replacing a significant amount of generation.
 - Indicates that FCM was successful.
- However, the large amount of Active DR creates operational challenges.

Challenges for the Future (cont)

- To Meet Operational Challenges identified in Operable Capacity Analysis, ISO recommends discussion of Market Rules related to:
 1. Dispatching Active DR
 2. Better Information for Demand Resources to facilitate Participation in the FCA
 3. Critical Peak Resources
 4. Technical Infrastructure for Demand Resources
 5. Demand Resource Risk Management Strategy

Dispatching Active DR

Dispatching Active DR

- Current FCM rules have two dispatch triggers for Active DR:
 - Shortage Events:
 - Intended to measure generator performance.
 - Determined after the fact and, therefore, not useful for real-time dispatch.
 - Day Ahead Load Forecast exceeds 95% of Seasonal Peak Load.
 - Does not address conditions when loads moderately high and capacity is short.

Dispatching Active DR (Continued)

- ISO Operations needs greater flexibility to Access Active DR:
 - Dispatch Active DR in blocks (just the amount needed) to prevent system from going into OP4.
 - Dispatch Active DR where needed and based on resource availability.
 - Dispatch based on day-ahead forecasted system conditions rather than the current dispatch trigger based on 95% of 50/50 load forecast.

Dispatching Active DR (Continued)

- Current dispatch triggers should be revisited in light of frequent usage of Active DR identified in Operable Capacity Analysis.
- Dispatch triggers fall into three categories:
 1. OP-4 Conditions,
 2. Non-OP-4 Conditions, and
 3. Selectable Rolling Blocks.

OP-4 Conditions

- Current of “Shortage Event” dispatch trigger.
 - Cannot dispatch Active DR until AFTER 30 minutes of system Reserve Constraint Penalty Factor pricing.
- Shortage Event Definition meant for generator performance and not the dispatch of assets.
 - Could delay activation of assets by up to one hour.
 - 30 minutes of pricing and then 30 minute ramp-up to full activation.
 - Does not allow for load zone or local dispatch of Active DR without FCA price separation.
 - Limits ability of DR to replace generators requesting to de-list.
 - Does not take into dispatch lumpiness/chatter.

OP-4 Conditions (Continued)

- Recommendations
 - Eliminate the tie to the Shortage Event Definition, which was never intended to be a dispatch trigger for Active DR.
 - Dispatch based on Real-Time System Conditions
 - Dispatch Active DR when the ISO begins to allow the depletion of 30-minute reserves (i.e., OP4 Action 6 and higher) locally, regionally or system wide.
 - Allow the operator to dispatch Active DR only when necessary and without delay.
 - Allow for the dispatch of Active DR to solve both local and load zone problems, like generation resources.

Non-OP-4 Conditions

- Under current FCM rules, Active DR (except RTEGs) is Dispatched:
 - When load on non-holiday weekdays in June, July, August, December, and January is forecast to be at or above 95% of the 50/50 Seasonal Peak Load Expectation (“PLE”).
- Operational Issues
 - Under high penetrations of Active DR, such resources will be needed to avoid going into OP4, even when peak loads are not expected.
 - The ISO needs access to Active DR off peak to support routine generator maintenance.

Non-OP-4 Conditions (Continued)

- **Recommendations:**

- Replace the 95% PLE dispatch with day ahead dispatch based on a forecast of OP4 Conditions.
 - Active DR would be called after all supply-side resources.
- Provides advanced notification to Demand Resources.
- Reduces the use of OP4 in real-time.
- Based on the Operable Capacity Analysis, this change should result fewer activations of Active DR.
 - 45 Hours where forecasted load exceeds 95% of 50/50 forecast.
 - 27 Hours overlap with proposed definition of DR Shortage Hours.
 - Therefore, Active DR would be activated 18 fewer hours.

Selectable Rolling Blocks

- The existing Market Rules do not address the issue of activating Active DR in selectable blocks.
- However, current Real-Time Demand Response Program rules (M-LRP) allow for activation of resources by load zone and by blocks.
- **Operational Issues without Selectable Rolling Blocks:**
 - Could Cause Reliability Problems
 - Activating several thousand MW of Active DR when only 100 MW is needed could result in severe overloads on the transmission system.
 - Overuses Active DR
 - No need to use 2,000 MW of Active DR if projected shortage is only 300 MW.
 - With RCPF Trigger, Could Create “OP4 Chatter”
 - If Active DR can only be dispatched in OP4 and all are dispatched at once, OP4 would end, prices would drop, and restoration of loads would put the system back into OP4, thus defeating the purpose of activating the Active DR in the first place.

Selectable Rolling Blocks (Continued)

- **Recommendations:**
- Clarify the market rules to state that the ISO will call only the amount of Active DR necessary for the event:
 - Modify the RTDR and RTEG activation rules such that the resources can be activated by the ISO in **selectable block loading** and at a **selectable geographic region** (i.e., load zone, UDS dispatch zone, nodal).
 - Implement an Active DR rotation methodology such that resources used to meet the requirements today will go to the bottom of the list to meet the requirements for another day.
- Require Project Sponsors to report to the ISO *hourly* availability of their Active DR.
 - Availability reports would be due prior to the start of the operating day.

Selectable Rolling Blocks (Continued)

- Activating the RTDR and RTEG resources in selectable blocks and rotating the resources will reduce the number of activation hours for any given resource. This change:
 - Recognizes that 100% of DR capacity is not needed during each activation,
 - Addresses the harm to reliability that 100% activation could impose on the system, and
 - Mitigates resource fatigue and improves overall DR performance.
- Potential block activation is consistent with the current Real-Time Demand Response Program rules.

Other Enhancements

Auction Transparency, Critical Peak Demand Resources,
and Technical Infrastructure

Other Enhancements

- **Auction Transparency**

- Provide additional information during each round of the Forward Capacity Auction regarding the remaining MW of Active and Passive DR.

- **Critical Peak Demand Resource Issues**

- Allow the ISO to limit the number of Critical Peak Demand Resources that do not have real-time telemetry and two-way communications with the ISO.

- **Technical Infrastructure**

- Enhance communications infrastructure between the ISO and Active DR providers.

Auction Transparency (Issues)

- DR Project Sponsors need information before and during the auction to plan projects and participate in the auction in an informed manner.
 - Currently, the ISO does not provide a forecast of the expected Active DR interruptions in a future delivery year making it difficult for DR Providers to calibrate their expectations of future performance requirements.
 - During the auction process, participants do not know how much of a particular asset class remains within a round, which leaves Active DR Providers without an understanding of how often they may be asked to perform if they clear the auction.
 - Local interruption studies must be done in order to provide transparency to the DR Providers and allow the ISO to understand the implications of generator delist requests during the auction process .

Auction Transparency (Recommendations)

- Before the Auction
 - Provide system-wide Operable Capacity Analysis results prior to each auction to allow DR Project Sponsors assess the implications of increased DR in the resource mix and the resulting increase in performance hours.
 - To better facilitate equal treatment of DR and generation, develop local Operable Capacity Analysis to address the concentration of DR and generation in congested areas, and the potential for substantial delisting of such resources in those areas.
- During the Auction
 - At the end of Each Round, provide the amount of supply, Active DR, and Passive DR remaining in the auction so that bidders can determine when it is no longer viable to stay in the auction – i.e., let the market determine how much DR is too much.
 - The “gaming” opportunities resulting from the provision of such information during the auction needs to be assessed.

Critical Peak Demand Resource (Issues)

- Critical Peak resources are required to reduce load under the same conditions as RTDR. In the first auction, 105 MW of Critical Peak resources cleared in FCA1 with the potential for over 700 MW in FCA2.
 - Unlike RTDR, Critical Peak Resources are not required to:
 - Have real-time telemetry with the ISO;
 - Receive activation notification directly from the ISO; and
 - Have any real-time communications with the ISO during an activation.
 - There is a financial incentive for DR to be Critical Peak Resources to avoid the real-time telemetry costs.
 - If New England had over 700 MW of Critical Peak Demand Resources, the sudden reduction and restoration of the load can create severe operational problems.
 - Similar to the “all or nothing” problem with RTDR activation.
 - ISO does not know exactly when they will reduce or restore load.
 - If, at any DR activation, New England needs less than 100% of the registered Critical Peak Demand Resources the ISO has no mechanism to activate less.

Critical Peak Demand Resources (Recommendations)

- Provide a low tech notification system to Critical Peak Demand Resources with no liability to the ISO or other Market Participants if the notice is not received.
- Require the interruption of Critical Peak Demand Resources before activating any RTDR or RTEG.
 - Without telemetry on Critical Peak resources, dispatching them first would give the ISO time to determine if the aggregate response of such resources is sufficient, or if further DR activations to are needed.
- Allow Critical Peak Demand Resources to convert to RTDR without penalty.
- Limit the amount of Critical Peak Demand Resources that can clear (or counts towards ICR) similar to the restrictions on RTEG.
- Eliminate Critical Peak as a category for the third auction.

Technical Infrastructure

(Control Room to Project Sponsor)

- Implement dual-redundant secure network between the ISO and the DR Provider.
 - Current Internet Based Communication System has single point of failure around provider denial of service, delays, or internet failure.
 - Potential for RIG replacement project as the new communications infrastructure:
 - Increased costs can be a barrier for small DR Providers, which will need to be addressed.
 - Real-time telemetry for Critical Peak Resources.
- Establish performance requirements for speed, accuracy, and magnitude of load reductions, but not establish communication technology requirements between the DR Provider and the Load.
 - Same risks exist here, but economics rule out dual redundant secure network – 911 type event could be an issue.
 - Downstream communication failures may result in interruptions of firm load.

Risk Management Strategy

Need for Risk Management Strategy

- Under the High Case Scenario, approximately 9% of the representative ICR is met using Active DR.
- As Active DR grows, the frequency of dispatch increases.
 - If the performance of Active DR diminishes in response to a higher frequency of dispatch, system reliability will diminish.
- A strategy is needed to balance the goal of allowing Active DR to freely participate in the FCM with the risk that higher participation of Active DR in the FCM may impact system reliability.

Need for Risk Management Strategy

- Active DR resources have not been tested under the FCM performance requirements and the frequency of dispatch expected in 2011/12.
- The accuracy of the Reserve Margin Gross up factor needs to be evaluated based on Planning studies.
- The ISO proposes to work with Stakeholders to:
 - Present the facts and findings of the Operable Capacity Analysis.
 - Solicit input to address these issues prior to the 3rd FCA.

Next Steps

- Continue stakeholder process.
- As soon as possible, implement rule changes that:
 - Clarify dispatch triggers for Active DR as soon as possible.
 - Dispatch Critical Peak DR first in the dispatch order.
 - Achieve auction transparency
 - Provide annual Operable Capacity Analysis.
 - Provide the amount of supply, Active DR, and Passive DR remaining in each round of the auction .
- Prior to FCA 3, implement rule changes to address:
 - The future of the Critical Peak DR type.
 - Develop risk management strategy.
- Complete technical infrastructure development by April 2010.

Technical Appendix

Technical Appendix - Contents

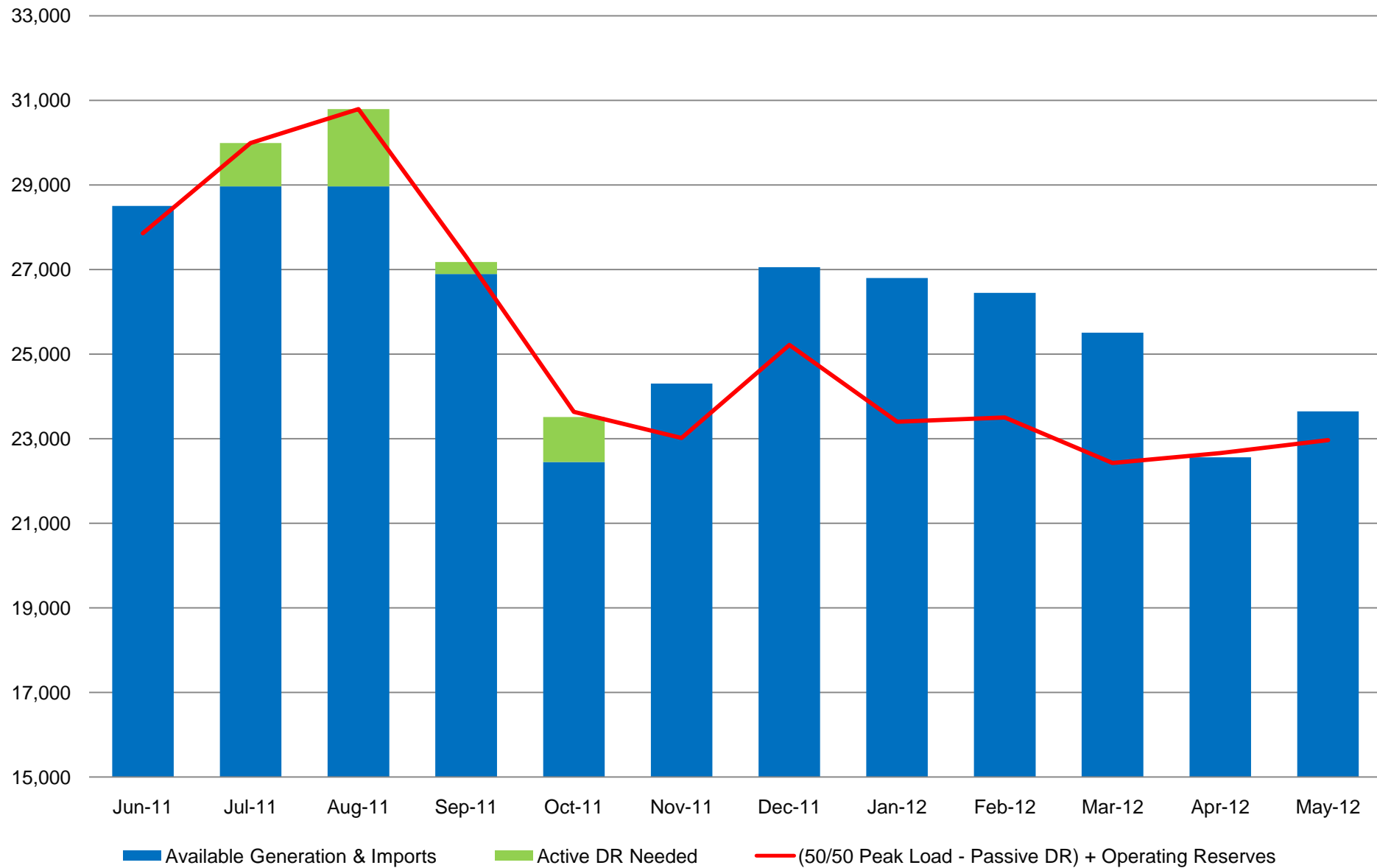
- Operable Capacity Analysis Details
- DR Summary – FCA#1 and FCA#2
- Demand Resource Types in the Current FCM Rules
 - On-Peak
 - Seasonal Peak
 - Critical Peak
 - Real-Time Demand Response
 - Real-Time Emergency Generation
- Other Demand Resource Integration Tasks

Operable Capacity Analysis Details

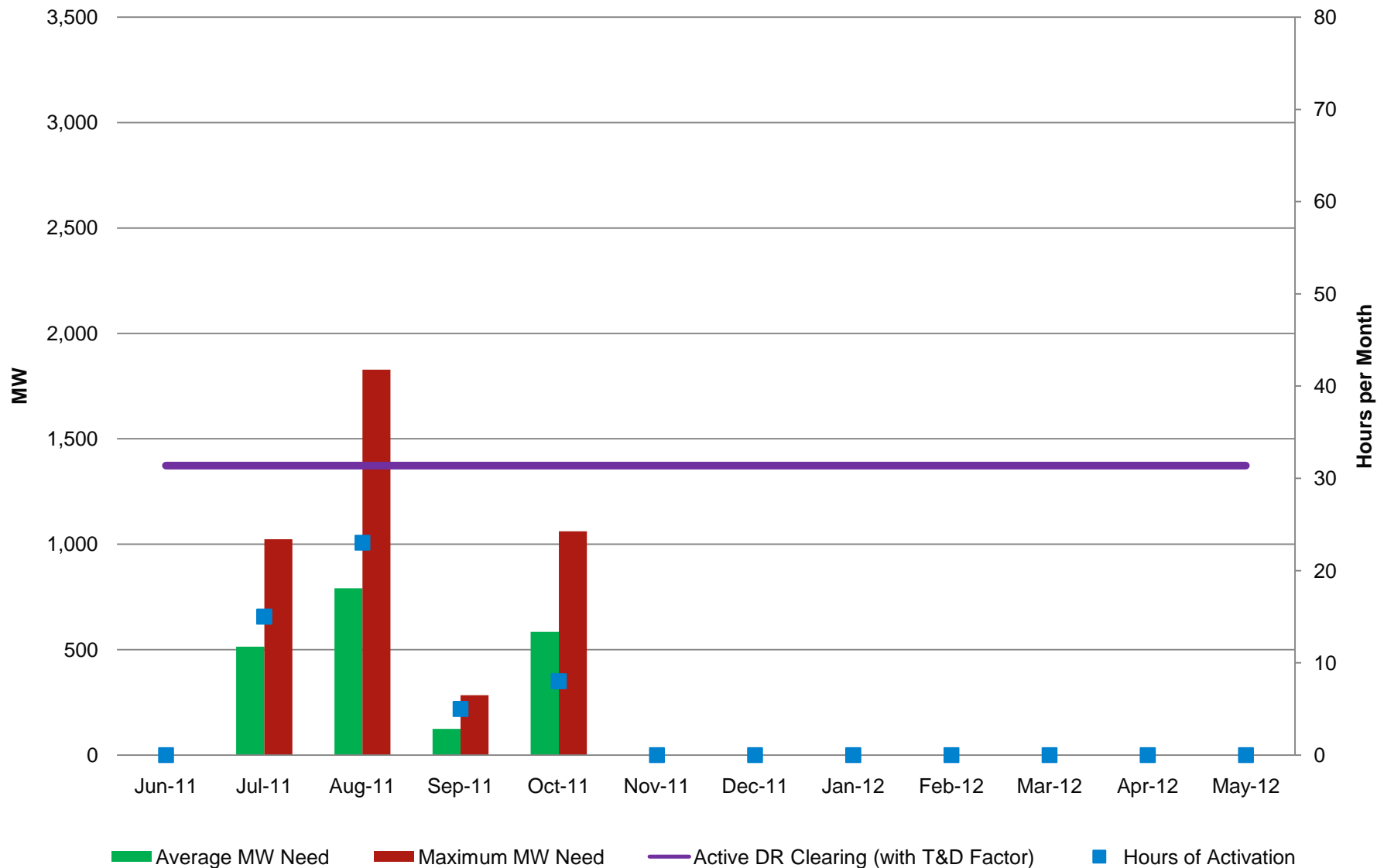
Operable Capacity Analysis – Low Case Details

	Jun-11	Jul-11	Aug-11	Sep-11	Oct-11	Nov-11	Dec-11	Jan-12	Feb-12	Mar-12	Apr-12	May-12	Total
1 Total Capacity	32,507	32,507	32,507	32,507	32,507	32,507	32,507	32,507	32,507	32,507	32,507	32,507	
Hydro-Quebec Capacity													
2 Deliveries	1,125	1,063	1,063	1,041	874	539	556	395	572	1,007	1,007	1,064	
3 Demand Resources	2,305	2,305	2,305	2,305	2,305	2,305	2,305	2,305	2,305	2,305	2,305	2,305	
Total Capacity without Demand Resources													
4 [1+2-3]	31,327	31,265	31,265	31,243	31,076	30,741	30,758	30,597	30,774	31,209	31,209	31,266	
Expected Generation													
5 Maintenance	0	0	0	1,875	5,625	2,720	300	575	800	3,300	6,125	4,140	
Allowance for Unplanned Generation													
6 Outages	2,825	2,300	2,300	2,475	3,000	3,720	3,400	3,225	3,525	2,400	2,525	3,480	
Resources Available to Meet Load & OR [4-5-6]	28,502	28,965	28,965	26,893	22,451	24,301	27,058	26,797	26,449	25,509	22,559	23,646	
Forecasted 50-50													
8 Monthly Peak Load	26,470	28,601	29,405	25,789	22,124	21,506	23,830	22,015	21,992	20,918	21,150	21,460	
Operating Reserve Requirements	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	
10 Passive Resources	612	612	612	489	489	489	612	612	489	489	489	489	
Peak Load + Operating Reserve Requirements													
11 [8+9-10]	27,858	29,989	30,793	27,300	23,635	23,017	25,218	23,403	23,503	22,429	22,661	22,971	
# of Hours Load & OR above Available													
12 Resources	0	15	23	5	8	0	0	0	0	0	0	0	51
Corresponding # of													
13 Days	0	4	4	2	1	0	0	0	0	0	0	0	11
Maximum # of													
14 Consecutive Days	0	2	4	2	1	0	0	0	0	0	0	0	4
Average MW Amount of													
15 DR Need	0	514	791	125	584	0	0	0	0	0	0	0	612
Maximum MW Amount													
16 of DR Need	0	1,024	1,828	284	1,061	0	0	0	0	0	0	0	1,828

Operable Capacity Analysis - Low Case



Active DR Need and Hours of DR Activation by Month (Low Case)



Active DR Need by Month (Low Case)

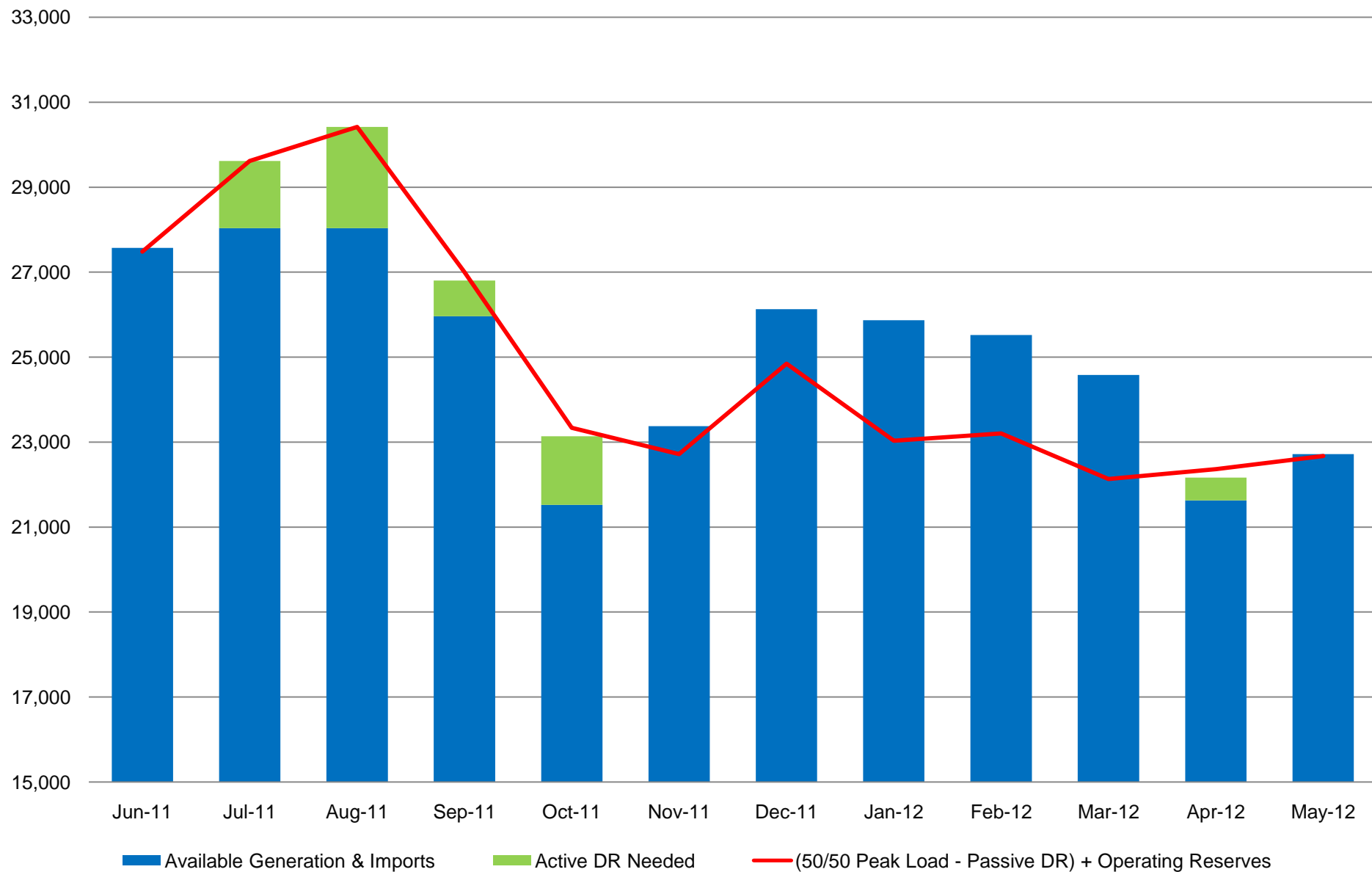
Month	Active DR (MW)	Event Hours	Event Days	Avg. Need (MW)	Avg. as % of Active DR	Max Need (MW)	Max as % of Active DR
Jun-11	1,373	0	0	0	0%	0	0%
Jul-11	1,373	15	4	514	37%	1,024	75%
Aug-11	1,373	23	4	791	58%	1,828	133%
Sep-11	1,373	5	2	125	9%	284	21%
Oct-11	1,373	8	1	584	43%	1,061	77%
Nov-11	1,373	0	0	0	0%	0	0%
Dec-11	1,373	0	0	0	0%	0	0%
Jan-12	1,373	0	0	0	0%	0	0%
Feb-12	1,373	0	0	0	0%	0	0%
Mar-12	1,373	0	0	0	0%	0	0%
Apr-12	1,373	0	0	0	0%	0	0%
May-12	1,373	0	0	0	0%	0	0%
Total		51	11				

Active DR (MW) includes 8% T&D factor, no Reserve Margin factor

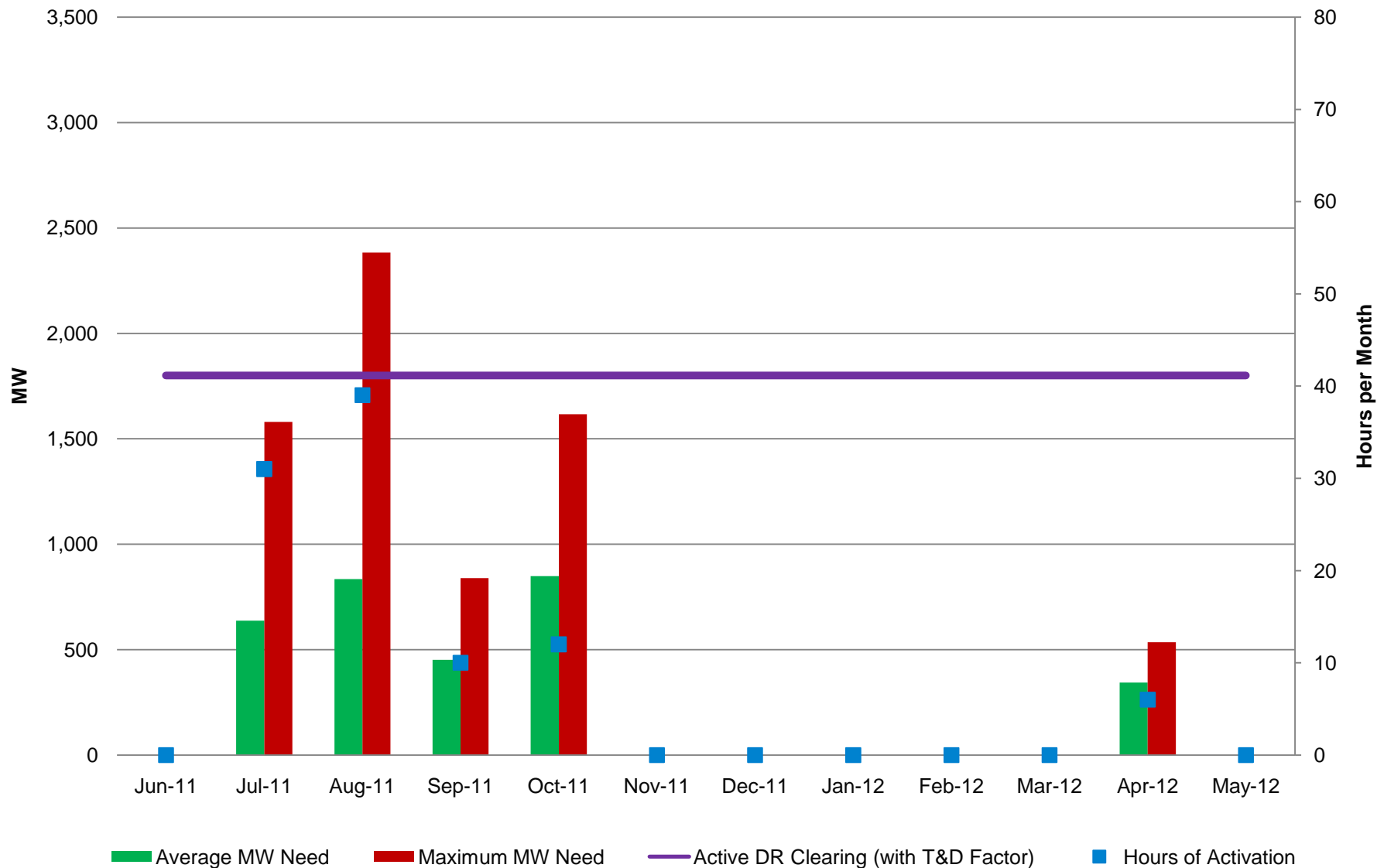
Operable Capacity Analysis – Intermediate Case Details

	Jun-11	Jul-11	Aug-11	Sep-11	Oct-11	Nov-11	Dec-11	Jan-12	Feb-12	Mar-12	Apr-12	May-12	Total
1 Total Capacity	32,507	32,507	32,507	32,507	32,507	32,507	32,507	32,507	32,507	32,507	32,507	32,507	
Hydro-Quebec Capacity													
2 Deliveries	1,125	1,063	1,063	1,041	874	539	556	395	572	1,007	1,007	1,064	
3 Demand Resources	3,233	3,233	3,233	3,233	3,233	3,233	3,233	3,233	3,233	3,233	3,233	3,233	
Total Capacity without Demand Resources													
4 [1+2-3]	30,399	30,337	30,337	30,315	30,148	29,813	29,830	29,669	29,846	30,281	30,281	30,338	
Expected Generation													
5 Maintenance	0	0	0	1,875	5,625	2,720	300	575	800	3,300	6,125	4,140	
Allowance for Unplanned Generation													
6 Outages	2,825	2,300	2,300	2,475	3,000	3,720	3,400	3,225	3,525	2,400	2,525	3,480	
Resources Available to													
7 Meet Load & OR [4-5-6]	27,574	28,037	28,037	25,965	21,523	23,373	26,130	25,869	25,521	24,581	21,631	22,718	
Forecasted 50-50													
8 Monthly Peak Load	26,470	28,601	29,405	25,789	22,124	21,506	23,830	22,015	21,992	20,918	21,150	21,460	
Operating Reserve													
9 Requirements	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	
10 Passive Resources	984	984	984	786	786	786	984	984	786	786	786	786	
Peak Load + Operating Reserve Requirements													
11 [8+9-10]	27,486	29,617	30,421	27,003	23,338	22,720	24,846	23,031	23,206	22,132	22,364	22,674	
# of Hours Load & OR above Available													
12 Resources	0	31	39	10	12	0	0	0	0	0	6	0	98
Corresponding # of													
13 Days	0	6	8	2	4	0	0	0	0	0	1	0	21
Maximum # of													
14 Consecutive Days	0	3	5	2	2	0	0	0	0	0	1	0	5
Average MW Amount of													
15 DR Need	0	637	835	452	849	0	0	0	0	0	344	0	734
Maximum MW Amount													
16 of DR Need	0	1,580	2,384	840	1,617	0	0	0	0	0	535	0	2,384

Operable Capacity Analysis - Intermediate Case



Active DR Need and Hours of DR Activation by Month (Intermediate Case)



Active DR Need by Month (Intermediate Case)

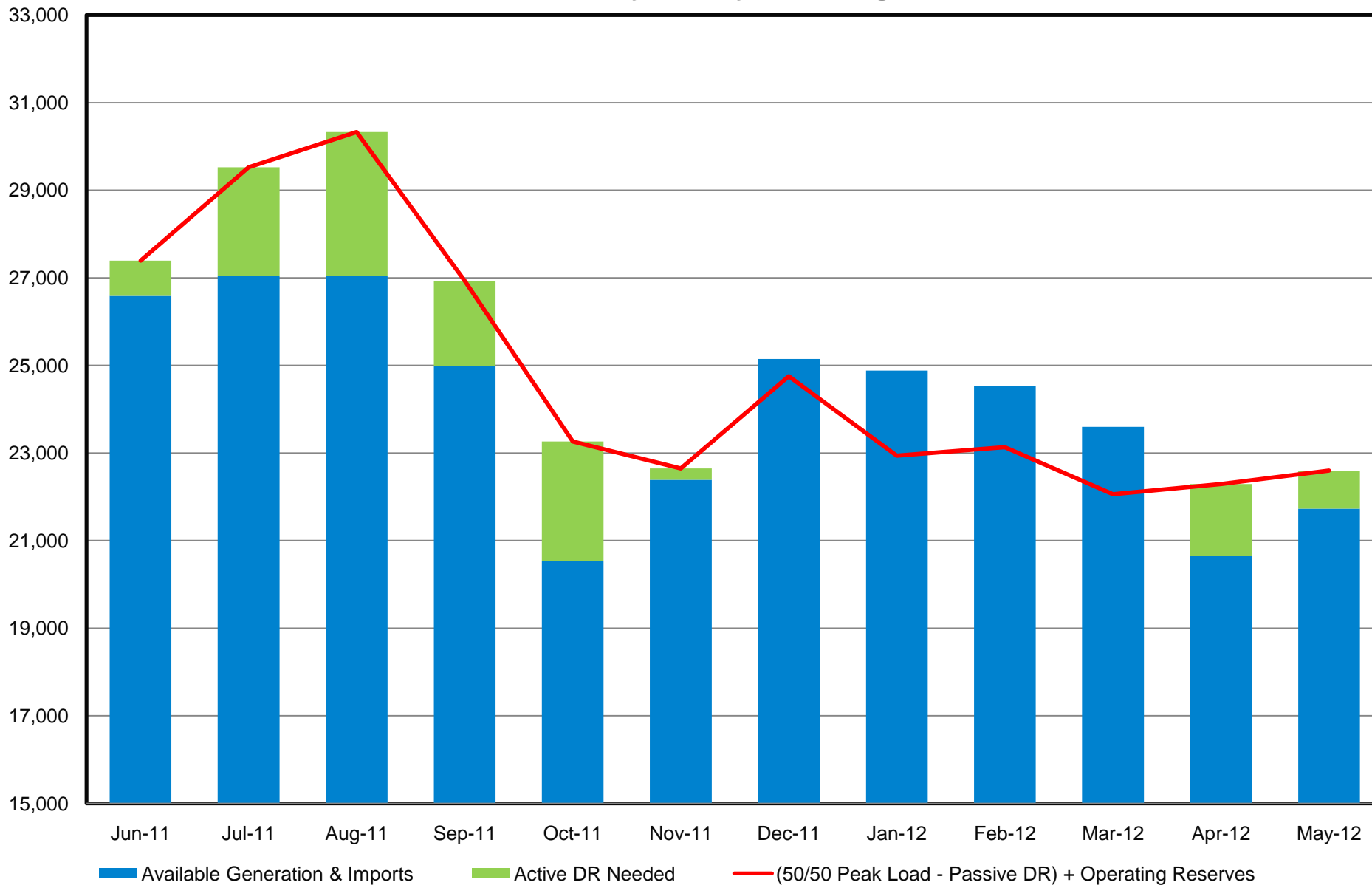
Month	Active DR (MW)	Event Hours	Event Days	Avg. Need (MW)	Avg. as % of Active DR	Max Need (MW)	Max as % of Active DR
Jun-11	1,800	0	0	0	0%	0	0%
Jul-11	1,800	31	6	637	35%	1,580	88%
Aug-11	1,800	39	8	835	46%	2,384	132%
Sep-11	1,800	10	2	452	25%	840	47%
Oct-11	1,800	12	4	849	47%	1,617	90%
Nov-11	1,800	0	0	0	0%	0	0%
Dec-11	1,800	0	0	0	0%	0	0%
Jan-12	1,800	0	0	0	0%	0	0%
Feb-12	1,800	0	0	0	0%	0	0%
Mar-12	1,800	0	0	0	0%	0	0%
Apr-12	1,800	6	1	344	19%	535	30%
May-12	1,800	0	0	0	0%	0	0%
Total		98	21				

Active DR (MW) includes 8% T&D factor, no Reserve Margin factor

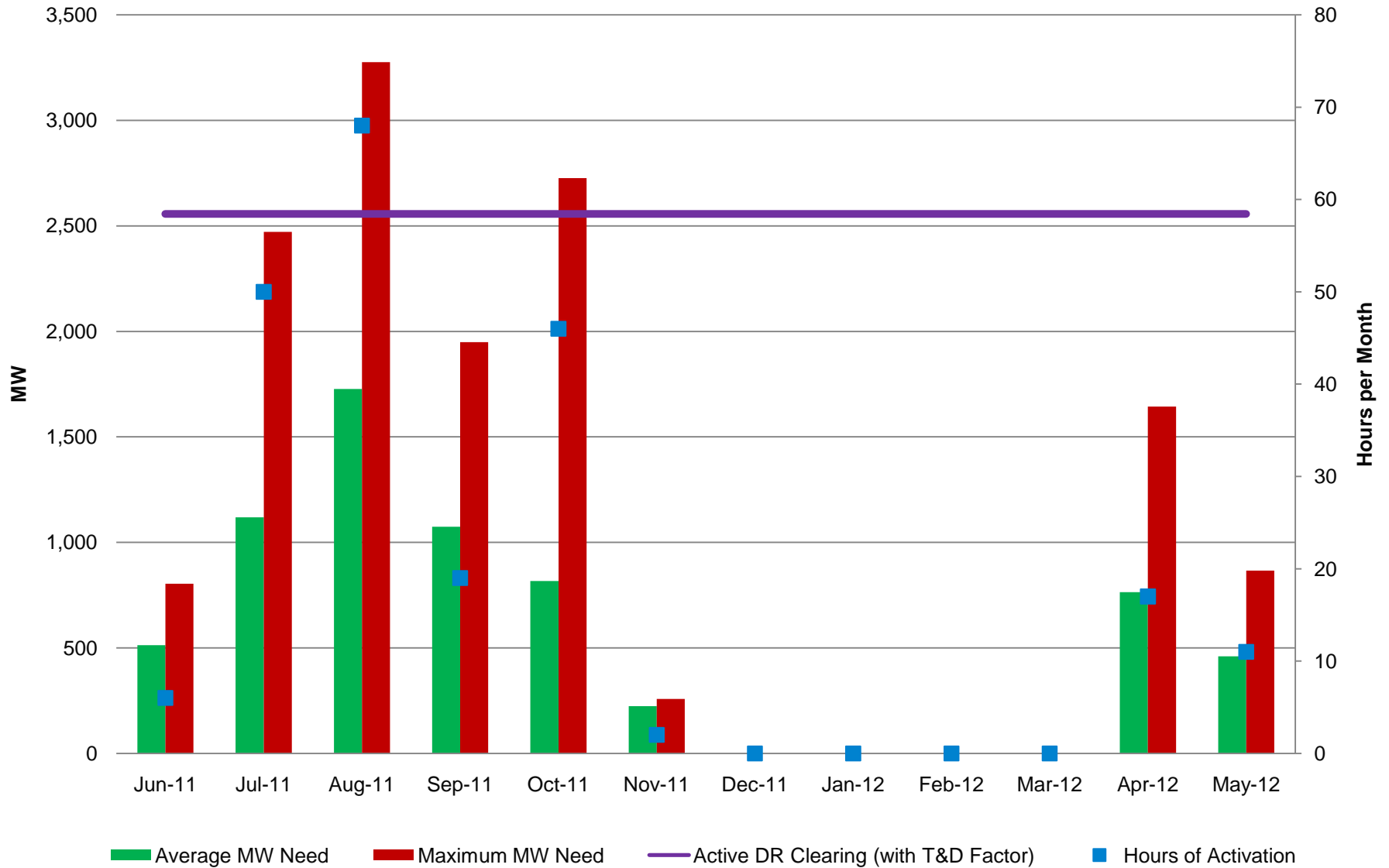
Operable Capacity Analysis – High Case Details

	Jun-11	Jul-11	Aug-11	Sep-11	Oct-11	Nov-11	Dec-11	Jan-12	Feb-12	Mar-12	Apr-12	May-12	Total
1 Total Capacity	32,507	32,507	32,507	32,507	32,507	32,507	32,507	32,507	32,507	32,507	32,507	32,507	
Hydro-Quebec Capacity													
2 Deliveries	1,125	1,063	1,063	1,041	874	539	556	395	572	1,007	1,007	1,064	
3 Demand Resources	4,218	4,218	4,218	4,218	4,218	4,218	4,218	4,218	4,218	4,218	4,218	4,218	
Total Capacity without Demand Resources													
4 [1+2-3]	29,414	29,352	29,352	29,330	29,163	28,828	28,845	28,684	28,861	29,296	29,296	29,353	
Expected Generation													
5 Maintenance	0	0	0	1,875	5,625	2,720	300	575	800	3,300	6,125	4,140	
Allowance for Unplanned Generation													
6 Outages	2,825	2,300	2,300	2,475	3,000	3,720	3,400	3,225	3,525	2,400	2,525	3,480	
Resources Available to													
7 Meet Load & OR [4-5-6]	26,589	27,052	27,052	24,980	20,538	22,388	25,145	24,884	24,536	23,596	20,646	21,733	
Forecasted 50-50													
8 Monthly Peak Load	26,470	28,601	29,405	25,789	22,124	21,506	23,830	22,015	21,992	20,918	21,150	21,460	
Operating Reserve													
9 Requirements	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	
10 Passive Resources	1,077	1,077	1,077	860	860	860	1,077	1,077	860	860	860	860	
Peak Load + Operating Reserve Requirements													
11 [8+9-10]	27,393	29,524	30,328	26,929	23,264	22,646	24,753	22,938	23,132	22,058	22,290	22,600	
# of Hours Load & OR above Available													
12 Resources	6	50	68	19	46	2	0	0	0	0	17	11	219
Corresponding # of													
13 Days	1	7	9	2	12	2	0	0	0	0	2	2	37
Maximum # of													
14 Consecutive Days	1	3	5	2	3	1	0	0	0	0	2	2	5
Average MW Amount of													
15 DR Need	513	1,118	1,727	1,075	818	225	0	0	0	0	764	460	1,004
Maximum MW Amount													
16 of DR Need	804	2,472	3,276	1,949	2,726	258	0	0	0	0	1,644	867	3,276

Operable Capacity Analysis - High Case



Active DR Need and Hours of DR Activation by Month (High Case)



Active DR Need by Month (High Case)

Month	Active DR (MW)	Event Hours	Event Days	Avg. Need (MW)	Avg. as % of Active DR	Max Need (MW)	Max as % of Active DR
Jun-11	2,556	6	1	513	20%	804	31%
Jul-11	2,556	50	7	1,118	44%	2,472	97%
Aug-11	2,556	68	9	1,727	68%	3,276	128%
Sep-11	2,556	19	2	1,075	42%	1,949	76%
Oct-11	2,556	46	12	818	32%	2,726	107%
Nov-11	2,556	2	2	225	9%	258	10%
Dec-11	2,556	0	0	0	0%	0	0%
Jan-12	2,556	0	0	0	0%	0	0%
Feb-12	2,556	0	0	0	0%	0	0%
Mar-12	2,556	0	0	0	0%	0	0%
Apr-12	2,556	17	2	764	30%	1,644	64%
May-12	2,556	11	2	460	18%	867	34%
Total		219	37				

Active DR (MW) includes 8% T&D factor, no Reserve Margin factor

Demand Resource Summary

FCA #1 and FCA #2

Demand Resource Summary (MW)

	FCA#1 (2010/11)	FCA#2 (2011/12)
SOI - New DR	2,813	1,883
Qualified - New DR	2,483	TBD
Total Cleared – New and Existing DR	2,279	TBD

Notes

All MW values include the T&D and Reserve Margin gross up factors applicable to each FCA. T&D factor is 1.08. Reserve Margin gross up is 1.143 and 1.161 for FCA#1 and FCA#2, respectively.

Total Cleared DR value reflects the 600 MW limit on RTEG.

Demand Resource Types in the Current FCM Rules

Demand Resource Types

- Demand Resources are defined ***by the way in which they reduce load***, not by technology.
 - Different technologies (energy efficiency equipment, energy management systems, direct load control, distributed generation, etc.) can reduce load in different ways depending on how they are designed and operated.

On-Peak Demand Resources



- Designed for non-dispatchable measures that are *not weather sensitive* and reduce load across pre-defined hours (e.g., lighting, motors, distributed generation, etc.).
- On-Peak Demand Resources must reduce load during the following hours:
 - **Summer On-Peak Hours:** 1 p.m. to 5 p.m. Non-Holiday Week Days in June, July and August
 - **Winter On-Peak Hours:** 5 p.m. to 7 p.m. Non-Holiday Week Days in December and January



Seasonal Peak Demand Resources

- Designed for non-dispatchable, weather-sensitive measures such as energy efficient HVAC measures.
- Seasonal Peak Demand Resources must reduce load when the ***Real-Time New England Hourly Load*** is equal to or greater than **90%** of the Expected Peak Load Forecast for the applicable Summer or Winter Season.



Critical Peak Demand Resources

- Designed for measures that can be dispatched by the project owner based on Day-Ahead forecasted load and Real-Time system conditions.
- Critical Peak Demand Resources must reduce load during the ISO's Day-Ahead Forecasted Peak Load Hours and emergency operating conditions.



Real-Time Demand Response Resources

- Designed for dispatchable measures with no air quality permitting restrictions on their use.
- The ISO will send Dispatch Instructions to Real-Time Demand Response Resources.
- The ISO will dispatch Real-Time Demand Response Resources during the ISO's Day-Ahead Forecasted Peak Load Hours and emergency operating conditions.

Real-Time Emergency Generation Resources

- Designed for Emergency Generators with Federal, State and/or Local air quality permit restrictions.
- The ISO will instruct the Emergency Generators to operate when there are extreme system emergencies that coincide with the ISO implementing a 5% voltage reduction.
- The total quantity (MW) of Emergency Generators used to satisfy ICR is limited to 600 MW.



Other Demand Resource Integration Tasks

ISO Demand Resource Integration Project:

- Other Areas of Study:
 - Asset Registration
 - Outage Coordination
 - Day Ahead Load Forecasting
 - Day Ahead Market
 - RAA Process
 - RT Processes
 - Training
 - Planning
 - Settlement